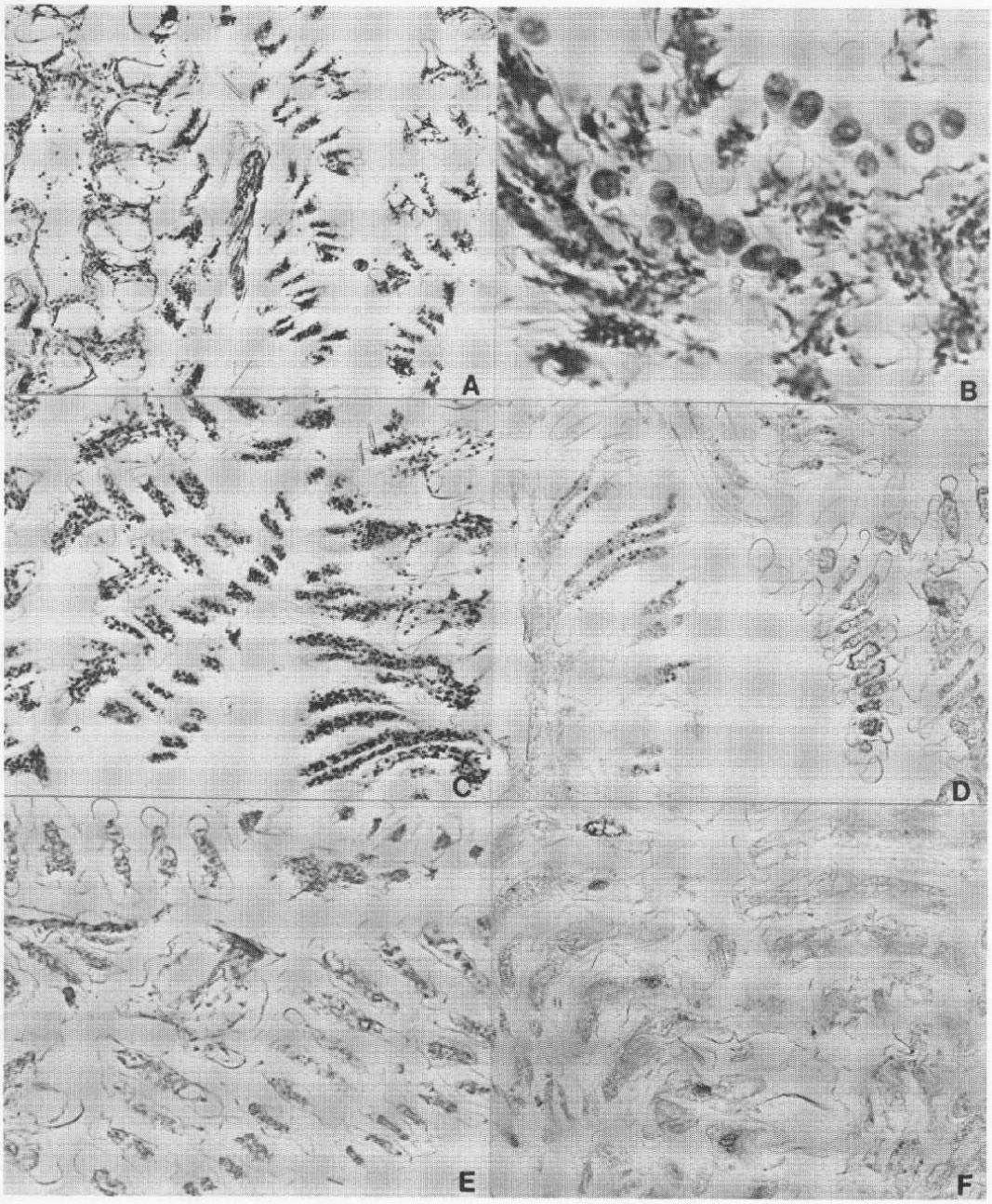

FIGURE 6.—**a.** Normal gills. 120×. **b.** An unidentified ciliated protozoan abundant on the gills at 4 h postmortem. 240×. **c.** Gills at 12 h postmortem. Note the absence of the protozoan and the presence of pyknotic nuclei in the cellular elements. 130×. **d.** Gills at 24 h postmortem. Except for a few pyknotic nuclei only the cuticle and cellular debris remain. 160×. **e.** Gills at 48 h postmortem. The tissue is still recognizable as gills; however, the lamellae are losing their usual "dumbbell" appearance and contain only eosinophilic cellular debris. 190×. **f.** Gills at 72 h postmortem. Gills were recognizable histologically only from this one of four animals examined. 120×.

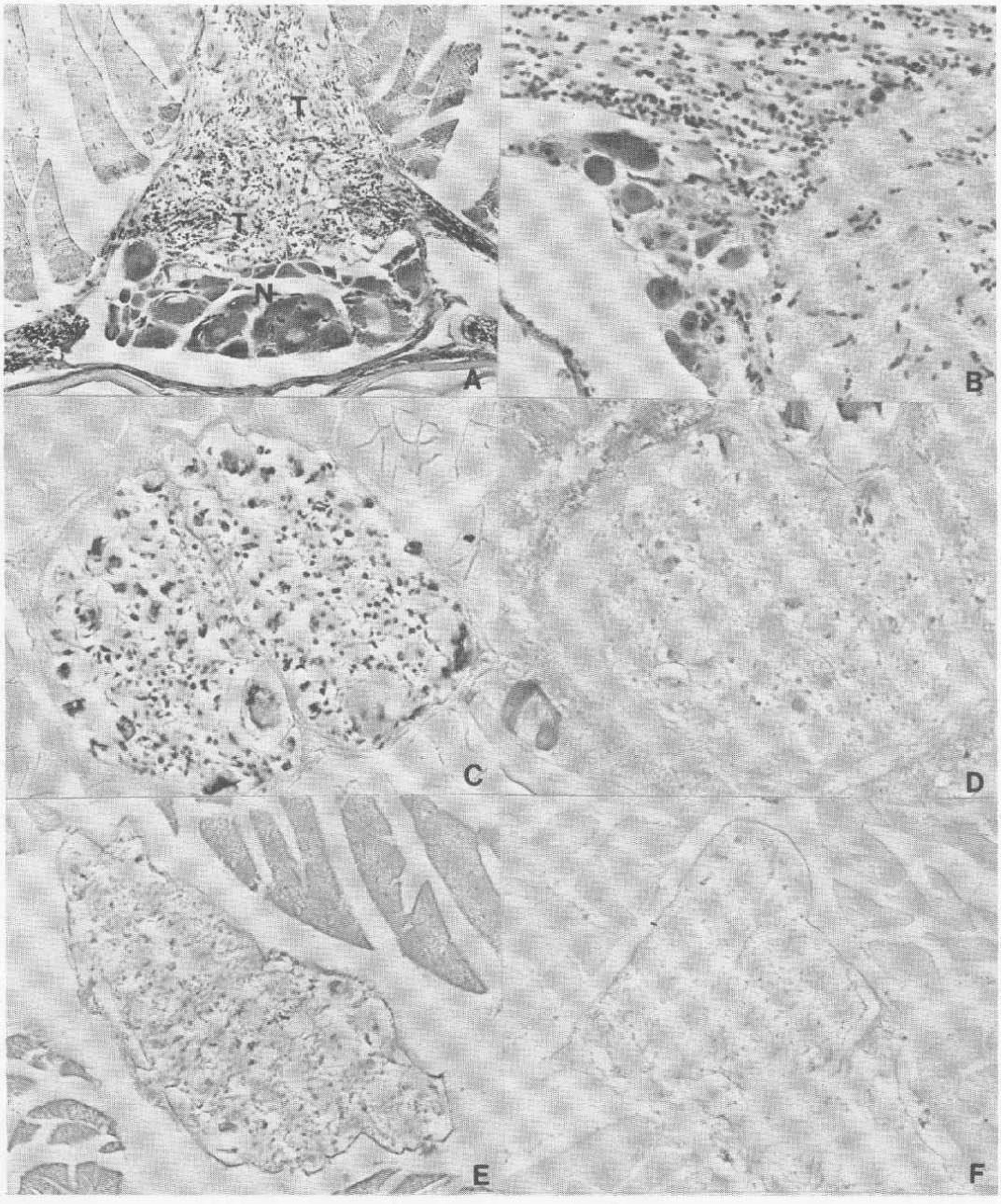

FIGURE 7.—**a.** Cross section of an abdominal segment ganglion on the ventral nerve (0 h control). Neuron perikaryons (N) are present ventral to the large ventral nerve tract (T). 110×. **b.** Sagittal section of an abdominal segment ganglion at 4 h postmortem. The neuron perikaryons are rounded and have pyknotic nuclei. Nerve cell processes, neurolemmal and glial cells in the nerve tract show no apparent autolysis. 220×. **c.** Cross section of the ventral nerve at 12 h postmortem. Nerve cell processes are not evident and neurolemmal and glial cells possess pyknotic nuclei. 200×. **d.** Cross section of the ventral nerve at 24 h postmortem. Only supportive fibrous tissue elements and eosinophilic debris remain. 190×. **e.** Cross section of ventral nerve at 48 h postmortem. Fibrous elements are still present. 200×. **f.** Ventral nerve in cross section at 72 h postmortem. The fibrous elements of the nerve are still present. 120×.

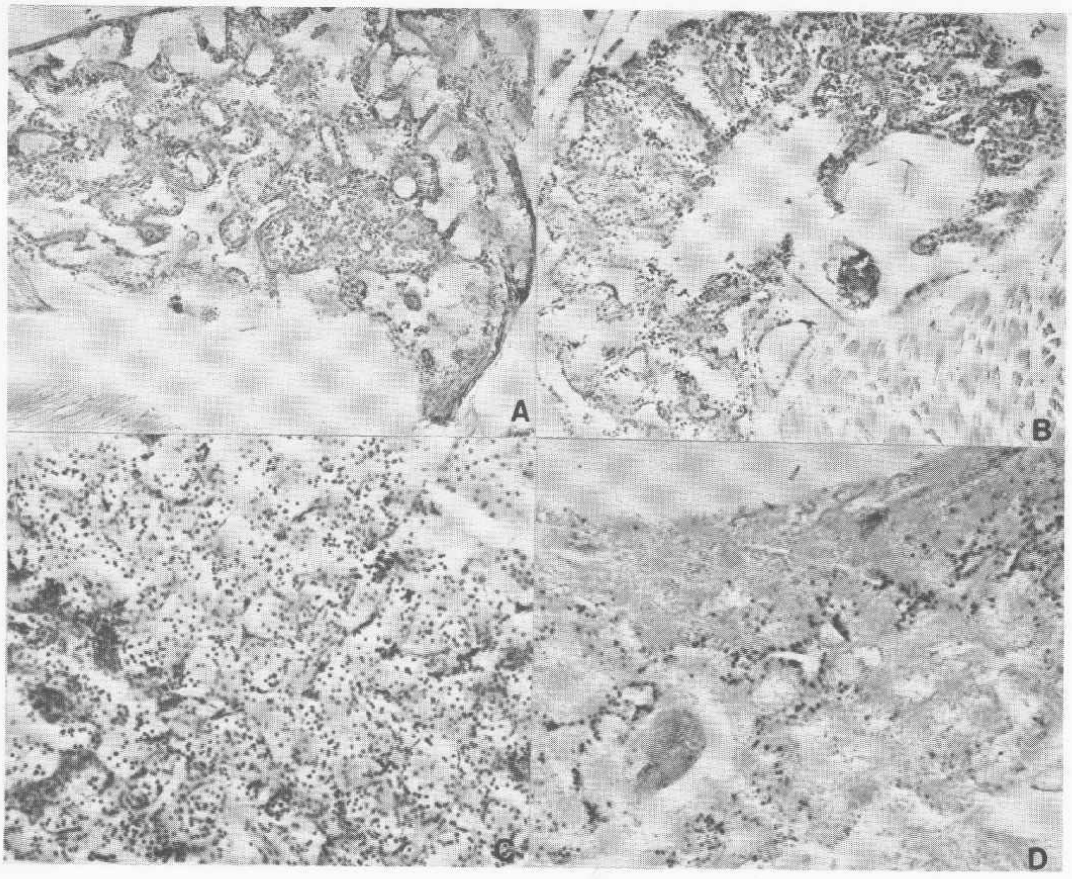

FIGURE 8.—**a.** Normal antennal gland. 100×. **b.** Antennal gland at 4 h postmortem. A few epithelial cells have been sloughed into the tubule lumens. 100×. **c.** The tubule epithelium of the antennal gland at 12 h postmortem showing intense nuclear pyknosis. 150×. **d.** Antennal gland at 24 h postmortem. The tubule epithelium has lysed filling the tubule lumens with eosinophilic debris and nuclear remnants. 150×.

become rigid. Whether this was due to desiccation of the tissues or actual rigor of the muscles was not determined. In the present study, freshly killed juvenile shrimp became rigid in sealed glass jars containing water-saturated air and when totally submerged in water. Desiccation was not possible. The time of onset of rigidity was, as in vertebrates, temperature-dependent, occurring earlier at higher temperatures than at lower temperatures.

Flick and Lovell (1972) in studying postmortem biochemical changes in penaeid shrimp reported that shrimp tails remained soft and did not exhibit any of the characteristics commonly associated with rigor mortis during a storage period of 10 days at 0°C. Perhaps the effect of freezing or near-freezing temperature on shrimp muscle either masks or inhibits the onset of physical rigor.

The rate of autolysis of the hepatopancreas is extremely rapid. The organ is a large, multifunctional organ believed to produce the bulk of enzymes used in the digestive process in shrimp and to have some absorptive and storage function. The hepatopancreas connects to the midgut near its origin from the pyloric stomach. The gut is a short, nearly straight tube, and, hence, enzymatic digestion must occur as rapidly as possible if the shrimp is to utilize its food efficiently. Even careful handling of shrimp to avoid stress before fixation, opening of the cuticle over the hepatopancreas, or excision and bisection of the gland to enhance fixation, frequently failed to provide adequate penetration and fixation of the organ when Formalin fixatives were used. The remaining tissues of shrimp are generally adequately fixed for light microscopy with Formalin, provided

that small pieces of tissue are used or that the cuticle is opened on smaller shrimp that are fixed whole.

The relative rates and patterns of postmortem change in shrimp are similar to those described for the oyster (Sparks and Pauley, 1964) and for mammals (Cruickshank, 1912; Smith and Jones, 1966). In mammals, oysters, and shrimp, tissues that produce large amounts of proteolytic enzymes such as the mammalian pancreas and lining epithelium of the stomach, oyster digestive tubules, and shrimp hepatopancreas and gut epithelium autolyze the most rapidly. Tissues that autolyze nearly as rapidly are high lipid containing tissues such as nerve tissue. In the shrimp and in mammals, muscle, connective, and epidermal tissues undergo the least rapid autolysis.

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